Table 2–1. Bacterial agents

Biological Agent/Disease	Anthrax	Brucellosis	E. coli serotype (O157:H7)	Tularemia	Cholera
Likely Method of Dissemination	1. Spores in aerosol 2. Sabotage (food)	1. Aerosol 2. Sabotage (food)	Water and food supply contamination	1. Aerosol 2. Rabbits or ticks	1. Sabotage (food and water) 2. Aerosol
Transmissible Person to Person	No (except cutaneous)	Unknown	Unknown, evidence passed person-to-person in day-care or nursing homes	No	Rare
Incubation Period	1 d to 43 d	1 wk to 3 wk, sometimes months	Unknown	2 d to 10 d	3 d to 5 d
Duration of Illness	3 d to 5 d (usually fatal)	Unknown	5 d to 10 d (most cases)	>2 wk	>1 wk
Lethality	Contact or cutaneous anthrax: fatality rate of 5 % to 20 % Inhalational anthrax: after symptoms appear almost always fatal, regardless of treatment	Low	0 % to 15 % if develop hemolytic uremic syndrome (HUS); 5 % if develop thrombotic thrombocytopenic purpura (TTP)	Moderate if left untreated	Low (<1 %) with treatment; high (>50 %) without
Vaccine Efficacy (for aerosol exposure)/ Antitoxin	Currently no human data	Vaccine under evaluation	No vaccine	No commercially available vaccine	No data on aerosol
Symptoms and Effects	Flu-like, upper-respiratory distress; fever and shock in 3 d to 5 d, followed by death	Irregular prolonged fever, profuse sweating, chills, joint and muscle pain, persistent fatigue	Gastrointestinal (diarrhea, vomiting) dehydration; in severe cases, cardiac arrest and death, HUS, or TTP	Chills; sustained fever; prostration; tendency for pneumonia; enlarged, painful lymph nodes; headache; malaise; anorexia; nonproductive cough	Sudden onset with nausea, vomiting, diarrhea, rapid dehydration, toxemia and collapse
Treatment	Vaccine available for cutaneous, possibly inhalation, anthrax. Cutaneous anthrax responds to antibiotics (penicillin, terramycin, chloromycetin), sulfadiazine, and immune serum. Pulmonary (inhaled) anthrax responds to immune serum in initial stages but is little use after disease is well established. Intestinal, same as for pulmonary	Antibiotics	Antibiotics available; most recover without antibiotics within 5 d to 10 d; do not use antidiarrheal agents	Vaccination using live attenuated organisms reduces severity and transmittability; antibiotics (streptomycin, aureomycin, chloromycetin, doxycycline, tetracycline, and chloramphenical)	Replenish fluids and electrolytes; antibiotics (tetracycline, ciprofloxicin, and erythromycin) enhance effectiveness of rehydration and reduce organism in body
Potential as Biological Agent	High, Iraqi and USSR biological programs worked to develop anthrax as a bio-weapon	Unknown	Unknown	High, if delivered via aerosol form (highly infectious, 90 % to 100 %)	Not appropriate for aerosol delivery

Table 2–1. Bacterial agents–Continued

Biological Agent/Disease	Diphtheria	Glanders	Melioidosis	Plague (Bubonic and Pneumonic)	Typhoid Fever
Likely Method of Dissemi-nation	Unknown	1. Aerosol 2. Cutaneous	1. Food contamination (rodent feces) 2.Inhalation 3.Insect bites 4. Direct contact with infected animals	1. Infected fleas (Bubonic and Pneumonic) 2. Aerosol (Pneumonic)	1. Contact with infected person 2. Contact with contaminated substances
Transmissible Person to Person	High	High	No	High (Pneumonic)	High
Incubation Period	2 d to 5 d	3 d to 5 d	Days	1 d to 3 d	7 d to 14 d
Duration of Illness	Unknown	Unknown	4 d to 20 d	1 d to 6 d (usually fatal)	Unknown
Lethality	5 % to 10 % fatality	50 % to 70 %	Variable	5 % to 10 % if treated Bubonic: 30 % to 75 % if untreated Pneumonic: 95 % if untreated	<1 % if treated; 10 % to 14 % if untreated
Vaccine Efficacy (for aerosol exposure)/ Antitoxin	DPT vaccine 85 % effective; booster recommended every 10 yr	No vaccine	No vaccine	Vaccine not available	Oral vaccine (Vivotif) and single dose injectable vaccine (capsular poly-saccharide antigen); both vaccines are equally effective and offer 65 % to 75 % protection against the disease
Symptoms and Effects	Local infection usually in respiratory passages; delay in treatment can cause damage to heart, kidneys, and central nervous system	Skin lesions, ulcers in skin, mucous membranes, and viscera; if inhaled, upper respiratory tract involvement	Cough, fever, chills, muscle/joint pain, nausea, and vomiting; progressing to death	Enlarged lymph nodes in groin; septicemic (spleen, lungs, meninges affected)	Prolonged fever, lymph tissue involvement; ulceration of intestines; enlargement of spleen; rose-colored spots on skin; constipation or diarrhea
Treatment	Antitoxin extremely effective; antibiotic (penicillin) shortens the duration of illness	Drug therapy (streptomycin and sulfadiazine) is somewhat effective	Antibiotics (doxycycline, chlorothenicol, tetracycline) and sulfadiazine	Doxycycline (100 mg 2x/d for 7 d); ciprofloxicin also effective	Antibiotics (amoxicillin or cotrimoxazole) shorten period of communicability and cure disease rapidly
Potential as Biological Agent	Very low—symptoms not severe enough to incapacitate; rare cases of severe infection	Unknown	Moderate—rare disease, no vaccine available	High—highly infectious, particularly in pneumonic (aerosol) form; lack of stability and loss of virulence complicate its use	Not likely to be deployed via aerosol; more likely for covert contamination of water or food

Table 2–2. Viral agents

Biological Agent/Disease	Marburg Virus	Junin Virus	Rift Valley Fever Virus	Smallpox	Venezuelan Equine Encephalitis
Likely Method of Dissemination	Aerosol	Epidemiology not known	Mosquito-borne; in biological scenario, aerosols or droplets	Aerosol	1. Aerosol 2. Infected vectors
Transmissible Person to Person	Unknown	Unknown	Unknown	High	No
Incubation Period	5 d to 7 d	7 d to 16 d	2 d to 5 d	10 d to 12 d	1 d to 6 d
Duration of Illness	Unknown	16 d	2 d to 5 d	4 wk	Days to weeks
Lethality	25 %	18 %	<1 %	20 % to 40 % (Viriole major) <1 % (Viriole minor)	1 % to 60 %
Vaccine Efficacy (for aerosol exposure)/ Antitoxin	No vaccine	No vaccine	Inactivated vaccine available in limited quantities	Vaccine protects against infection within 3 d to 5 d of exposure	Experimental only: TC–83 protects against 30 LD_{50}s to 500 LD_{50}s in hamsters
Symptoms and Effects	Sudden onset of fever, malaise, muscle pain, headache, and conjunctivitis, followed by sore throat, vomiting, diarrhea, rash, and both internal and external bleeding (begins 5th day). Liver function may be abnormal and platelet function may be impaired.	Hemorrhagic syndrome, chills, sweating, exhaustion and stupor	Febrile illness, sometimes abdominal tenderness; rarely shock, ocular problems	Sudden onset of fever, headache, backache, vomiting, marked prostration, and delirium; small blisters form crusts which fall off 10 d to 40 d after first lesions appear; opportunistic infection	Sudden illness with malaise, spiking fevers, rigors, severe headache, photophobia, and myalgias
Treatment	No specific treatment exists. Severe cases require intensive supportive care, as patients are frequently dehydrated and in need of intravenous fluids.	No specific therapy; supportive therapy essential	No studies, but IV ribavirin (30 mg/kg/6 h for 4 d, then 7.5 mg/kg/8 h for 6 d) should be effective	Vaccinia immune globulin (VIG) and supportive therapy	Supportive treatments only
Potential as Biological Agent	High—actually weaponized by former Soviet Union biological program	Unknown	Difficulties with mosquitos as vectors	Possible, especially since routine smallpox vaccination programs have been eliminated world-wide (part of USSR offense bioprogram)	High—former U.S. and U.S.S.R. offensive biological programs weaponized both liquid and dry forms for aerosol distribution

Table 2–2. Viral agents–Continued

Biological Agent/Disease	Yellow Fever Virus	Dengue Fever Virus	Ebola Virus	Congo-Crimean Hemorrhagic Fever Virus
Likely Method of Dissemination	Mosquito-borne	Mosquito-borne	1. Direct contact 2. Aerosol (BA)	Unknown
Transmissible Person to Person	No	No	Moderate	Yes
Incubation Period	3 d to 6 d	3 d to 15 d	4 d to 16 d	7 d to 12 d
Duration of Illness	2 wk	1 wk	Death between 7 d to 16 d	9 d to 12 d
Lethality	10 % to 20 % death in severe cases or full recovery after 2 d to 3 d	5 % average case fatality by producing shock and hemorrhage, leading to death	High for Zaire strain; moderate with Sudan	15 % to 20 %
Vaccine Efficacy (for aerosol exposure)/ Antitoxin	Vaccine available; confers immunity for >10 yr	Vaccine available	No vaccine	No vaccine available; prophylactic ribavirin may be effective
Symptoms and Effects	Sudden onset of chills, fever, prostration, aches, muscular pain, congestion, severe gastrointestinal disturbances, liver damage and jaundice; hemorrhage from skin and gums	Sudden onset of fever, chills, intense headache, pain behind eyes, joint and muscle pain, exhaustion and prostration	Mild febrile illness, then vomiting, diarrhea, rash, kidney and liver failure, internal and external hemorrhage (begins 5th day), and petechiae	Fever, easy bleeding, petechiae, hypotension and shock; flushing of face and chest, edema, vomiting, diarrhea
Treatment	No specific treatment; supportive treatment (bed rest and fluids) for even the mildest cases	No specific therapy; supportive therapy essential	No specific therapy; supportive therapy essential	No specific treatment
Potential as Biological Agent	High, if efficient dissemination device is employed	Unknown	Former Soviet Union	Unknown

Table 2–3. Rickettsiae

Biological Agent/Disease	Endemic Typhus	Epidemic Typhus	Q Fever	Rocky Mountain Spotted Fever
Likely Method of Dissemination	1. Contaminated feces 2. Infected insect larvae 3. Rat or flea bites	1. Contaminated feces 2. Infected insect larvae	1. Sabotage (food supply) 2. Aerosol	Infected wood ticks
Transmissible Person to Person	No	No	Rare	No
Incubation Period	6 d to 14 d	6 d to 15 d	14 d to 26 d	3 d to 14 d
Duration of Illness	Unknown	Unknown	Weeks	Unknown
Lethality	1 %, increasing in people >50 yr old	10 % to 40 % untreated; increases with age	Very low	15 % to 20 % untreated (higher in adults); treated—death rare with specific therapy (tetracycline or chloramphenicol)
Vaccine Efficacy (for aerosol exposure)/ Antitoxin	Unknown	Vaccine confers protection of uncertain duration	94 % protection against 3500 LD_{50}s in guinea pigs	No vaccine
Symptoms and Effects	Sudden onset of headache, chills, prostration, fever, pain; maculae eruption on 5th day to 6th day on upper body, spreading to all but palms, soles, or face, but milder than epidemic form	Sudden onset of headache, chills, prostration, fever, pain; maculae eruption on 5th day to 6th day on upper body, spreading to all but palms, soles, or face	Mild symptoms (chills, headaches, fever, chest pains, perspiration, loss of appetite)	Fever and joint pain, muscular pain; skin rash that spreads rapidly from ankles and wrists to legs, arms, and chest; aversion to light
Treatment	Antibiotics (tetracycline and chloramphenicol); supportive treatment and prevention of secondary infections	Antibiotics (tetracycline and chloramphenicol); supportive treatment and prevention of secondary infections	Tetracycline (500 mg/ 6 h, 5 d to 7 d) or doxycycline (100 mg/ 12 h, 5 d to 7 d) also, combined Erthyromycin (500 mg/6 h) and rifampin (600 mg/d)	Antibiotics—tetracycline or chloramphenicol
Potential as Biological Agent	Uncertain—broad range of incubation (6 d to 14 d) period could cause infection of force deploying biological agent	Uncertain—broad range of incubation (6 d to 14 d) period could cause infection of force deploying biological agent	Highly infectious, is delivered in aerosol form. Dried agent is very stable; stable in aerosol form.	Unknown

Table 2–4. Biological toxins

Biological Agent/Disease	Botulinum Toxin	Staphylococcal enterotoxin B	Tricothecene mycotoxins	Ricin (Isolated from Castor Beans)	Saxitoxin
Likely Method of Dissemination	1. Aerosol 2. Sabotage (food and water)	1. Sabotage (food supply) 2. Aerosol	1. Aerosol 2. Sabotage	1. Aerosol 2. Sabotage (food & water)	Contaminated shellfish; in biological scenario, inhalation or toxic projectile
Transmissible Person to Person	No	No	No	No	No
Incubation Period	Variable (hours to days)	3 h to 12 h	2 h to 4 h	Hours to days	5 min to 1 h
Duration of Illness	Death in 24 h to 72 h; lasts months if not lethal	Hours	Days to months	Days—death within 10 d to 12 d for ingestion	Death in 2 h to 12 h
Lethality	5 % to 60 %, untreated <5 % treated	<1 %	Moderate	100 %, without treatment	High without respiratory support
Vaccine Efficacy (for aerosol exposure)/ Antitoxin	Botulism antitoxin (IND) Prophylaxis toxoid (IND) Toxolide	No vaccine	No vaccine	No vaccine	No vaccine
Symptoms and Effects	Ptosis; weakness, dizziness, dry mouth and throat, blurred vision and diplopia, flaccid paralysis	Sudden chills, fever, headache, myalgia, nonproductive cough, nausea, vomiting and diarrhea	Skin—pain, pruritis, redness and vesicles, sloughing of epidermis; respiratory—nose and throat pain, discharge, sneezing, coughing, chest pain, hemoptysis	Weakness, fever, cough, pulmonary edema, severe respiratory distress	Light headedness, tingling of extremities, visual disturbances, memory loss, respiratory distress, death
Treatment	Antitoxin with respiratory support (ventilation)	Pain relievers and cough suppressants for mild cases; for severe cases, may need mechanical breathing and fluid replenishment	No specific antidote or therapeutic regimen is available; supportive and symptomatic care	Oxygen, plus drugs to reduce inflammation and support cardiac and circulatory functions; if ingested, empty the stomach and intestines; replace lost fluids	Induce vomiting, provide respiratory care, including artificial respiration
Potential as Biological Agent	Not very toxic via aerosol route; extremely lethal if delivered orally. Since covert poisoning is indistinguishable from natural botulism, poisoning could have limited use	Moderate—could be used in food and limited amounts of water (for example, at salad bars); LD_{50} is sufficiently small to prevent detection	High—used in aerosol form ("yellow rain") in Laos, Kampuchea and Afghanistan (through 1981)	Has been used in 1978—Markov murder (see app. A, ref. 6); included on prohibited Schedule I chemicals list for Chemical Weapons Convention; high potential for use in aerosol form	Moderate, aerosol form is highly toxic